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## Flawed environmental justice analyses

In December 2016, the Federal Energy Regulatory Commission (FERC) issued a draft environmental impact statement (DEIS) for the Atlantic Coast Pipeline, a natural gas pipeline proposed to run approximately 1000 km from West Virginia to end points in Virginia and North Carolina (1). The developer, a partnership of utility corporations, contends that the project is needed to meet the region's growing energy needs.

The proposed route crosses territories of four Native American tribes in North Carolina. Because poor and minority communities have long been excluded from environmental decision-making (2), all federal agencies must now identify and address environmental justice issues during formal assessments and reviews of projects such as the Atlantic Coast Pipeline (3). Such projects can have wide-ranging impacts on human communities associated with land rights and property values, public safety in the event of leaks and explosions, and regional climate change exacerbated by fugitive methane emissions (4) and combustion of natural gas.

In addition to these issues, Native American tribes have unique concerns deriving from their status as indigenous peoples. Tribes have deep connections to ancestral and modern-day territories, and these connections are often important to tribal concepts of identity, history, culture, spirituality, and governance. Sacred sites, archaeological resources, and natural

features integrate to form cultural landscapes that are unique to each tribe.

The Atlantic Coast Pipeline developer's preferred route disproportionately affects indigenous peoples in North Carolina. The nearly 30,000 Native Americans who live within 1.6 km of the proposed pipeline make up 13.2% of the impacted population in North Carolina, where only 1.2% of the population is Native American [Appendix U in (1)]. Yet, the DEIS reported that fewer than half of the areas along the proposed route had minority populations higher than county-level baseline proportions (1). The discrepancy stems from the DEIS's failure to account for large differences in population size in the studied areas; large minority populations in some places were masked by much smaller nonminority populations elsewhere. The analysis also failed to account for large differences in baseline demographics among counties, where minority populations range from less than 1% to nearly 70% [Appendix U in (1)]. These large differences prevented meaningful comparisons among areas in different counties. Together, these flaws rendered FERC's analysis incapable of detecting large Native American populations along the route, leading to false conclusions about the project's impacts. Notably, the analysis conformed to the generic guidelines prescribed by the U.S. Environmental Protection Agency (1).

Environmental justice analyses are meant to help regulators and developers identify and address disparate impacts on vulnerable populations at an early stage in the decision-making process (3, 5, 6). Analyses unable to detect such impacts are essentially faulty instruments that fail to warn decision-makers about potential problems ahead. In the case of the Atlantic Coast Pipeline, a

Members of North Carolina's Lumbee tribe prepare to perform a traditional dance in 2004. Their lands lie in the path of the planned Atlantic Coast Pipeline.

more thorough analysis might have alerted regulators to large Native American populations along the proposed route and the need to consult with tribal governments.

The Dakota Access Pipeline controversy (7) demonstrates that all parties suffer when environmental justice analyses and tribal consultation are treated as meaningless rote exercises. Tribes suffer erosion of sovereignty and damage to cultural landscapes, federal-tribal relations deteriorate, and developers incur setbacks.

Developers and regulators of the Atlantic Coast Pipeline still have a window of opportunity to take these lessons to heart. Regulators can consult with tribes before making a final decision on the project later this year, and they can acknowledge the project's true impacts on vulnerable populations by addressing the flawed environmental justice analysis. Scientists can help by sharing rigorous methods, providing oversight, and partnering with vulnerable communities. It is not too late to work toward environmental justice for all.

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## Mexico's basic science funding falls short

During his inauguration address in December 2012, Mexico's President Enrique Peña Nieto vowed to move the country forward by investing in education as well as in science and technology (S&T). In two government documents (1, 2), he pledged to increase the S&T federal expenditure (which had been lingering for years at about 0.4% of the gross domestic product) up to a minimum of 1% by 2018 (2, 3). A few months earlier, the National Autonomous University of Mexico, together with the

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